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A new approximate equation for the measured value of a cosmological constant

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Abstract

I have found a new approximate equation for the measured value of the cosmological constant, which may lead to an absurd but interesting result, that is, the cosmological constant seems to be a constant. And this discovery starts with the new discovery of the Compton scattering formula, and in the process, we provide evidence to prove whether this new discovery can be falsified. Then, for another phenomenon β decay time, we provide a new approximate equation, and then return to the cosmological constant. Finally, we discover that the proton mass is the hidden line in it.

Keywords: Cosmological constant, Compton scattering formula, β decay time, proton mass

1 Measurement of Cosmological Constant

We know that the measured value of the cosmological constant is approximately $(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}\ \text{m}^{-2}$.

That is to say: $(\Lambda_{\text{eff}}) = \frac{(8\pi)(G_N)}{(c)^2}(\rho_{\Lambda,\text{mass}}) = \frac{(8\pi)(G_N)}{(c)^4}(\rho_{\Lambda,\text{energy}})$.

And: $(\rho_{\text{crit,mass}}) = \frac{3(H_0)^2}{(8\pi)(G_N)}$, and: $(\rho_{\Lambda,\text{mass}}) = (\Omega_\Lambda)(\rho_{\text{crit,mass}})$, after substituting into the cosmological constant relationship, we obtain: $(\Lambda_{\text{eff}}) = \frac{(8\pi)(G_N)}{(c)^2}(\Omega_\Lambda)\frac{3(H_0)^2}{(8\pi)(G_N)}$, therefore: $(\Lambda_{\text{eff}}) =$

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$\frac{3(\Omega_\Lambda)(H_0)^2}{(c)^2}$. Then, using $(H_0) \approx 2.18 \times 10^{-18}$ s^{-1} and $(\Omega_\Lambda) \approx 0.685$, we can obtain $(\Lambda_{\text{eff}}) \approx \frac{3(0.685)(2.18 \times 10^{-18})^2}{(2.998 \times 10^8)^2}$ m^{-2}. Namely: $(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}$ m^{-2}.

Among them, the Hubble constant corresponding to Planck 2018 is approximately $(H_0) = 67.36 \pm 0.54$ km s^{-1} Mpc^{-1}. Using the conversion relationship: 1 Mpc $= 3.08567758 \times 10^{19}$ km, therefore: $(H_0) = \frac{67.36 \text{ km s}^{-1}}{3.08567758 \times 10^{19} \text{ km}} \approx 2.183 \times 10^{-18}$ s^{-1}.

The Hubble constant (H_0) can be determined relatively directly through observation: measuring the distance of neighboring galaxies and their redshift velocity relationship due to the expansion of the universe. Common methods include distance steps for Cepheid type Ia supernovae, gravitational wave standard whistle, and strong gravitational lensing delay. However, the different measurement methods for (H_0) are currently not completely consistent. For example, the result based on local distance steps is usually around 73 km s^{-1} Mpc^{-1}; The result obtained by putting the cosmic microwave background radiation data into the standard CDM model is approximately 67.4 km s^{-1} Mpc^{-1}. This difference is called the 'Hubble Tension'.

However, the cosmological constant density parameter $_\Lambda$ cannot be measured separately and directly like reading an instrument value in a laboratory. It is a parameter fitted or inferred through observational data such as cosmic microwave background radiation, Type Ia supernovae, baryon acoustic oscillations, galaxy distribution, and gravitational lensing, combined with cosmological models.

2 Theoretical values of Planck scale cosmological constant

In general relativity, the effective cosmological constant that truly affects the expansion of the universe is $(\Lambda_{\text{eff}}) = (\Lambda_{\text{bare}}) + \frac{(8\pi)(G_N)}{(c)^4}(\rho_{\text{vac}})$.

Here: (Λ_{bare}) represents the bare cosmological constant in theory. And: (ρ_{vac}) represents the contribution of quantum field vacuum fluctuations.

The observed effective cosmological constant is approximately $(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}$ m^{-2}, $(\rho_{\Lambda,\text{mass}}) = \frac{(\rho_{\Lambda,\text{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}$ kg m^{-3}.

The effective cosmological constant is approximately $(\Lambda_{\text{eff}}) \sim \frac{(8\pi)(G_N)}{(c)^4} \times 10^{-9}$ J m^{-3}.

And the reason why theoretical estimates are about 120 orders of magnitude higher than observed val-

ues refers to: $(\Lambda_{\text{vac}}) \sim \frac{(8\pi)(G_N)}{(c)^4} \times 10^{113}\ \text{J m}^{-3}$, where the vacuum energy density $(\rho_{\text{vac}}) \sim \frac{(g)}{(4\pi)^2}\frac{(c)^7}{(\hbar)(G_N)^2}$ takes Planck Scale Estimation $(\rho_{\text{vac,theory}}) \sim 10^{111}$–$10^{113}\ \text{J m}^{-3}$.

Although it may seem absurd, we still need to explain how this value came about. In quantum field theory, every momentum mode can be seen as a quantum harmonic oscillator. The energy level of a quantum harmonic oscillator is $E_n = \left(n + \frac{1}{2}\right)(\hbar)\omega$. Even in the ground state, i.e., assuming $n = 0$, it still has a zero point energy of $E_0 = \frac{1}{2}(\hbar)\omega$. Among them: $(\hbar) = \frac{(h)}{(2\pi)}$, for massless particles such as photons, the frequency and wavenumber satisfy: $\omega = (c)k$.

Therefore, the zero point of a pattern can be: $E_0 = \frac{1}{2}(\hbar)(c)k$.

In a space with a volume of V, the state number density of momentum modes is $\frac{V}{(2\pi)^3}d^3k$. After dividing it by the volume, the number of modes per unit volume is $\frac{d^3k}{(2\pi)^3}$. Therefore, the zero point energy density can be written as: $(\rho_{\text{vac}}) = \frac{1}{2}\int \frac{d^3k}{(2\pi)^3}(\hbar)\omega$.

So, if we consider having $g$internal degrees of freedom, such as polarization or different particle types, then $(\rho_{\text{vac}}) = \frac{(g)}{2}\int \frac{d^3k}{(2\pi)^3}(\hbar)(c)k$.

So, if we use the spherical coordinate relationship: $d^3k = (4\pi)k^2dk$, we can get: $(\rho_{\text{vac}}) = \frac{(g)}{2}\frac{4\pi}{(2\pi)^3}\int_0^{k_{\max}}(\hbar)(c)k^3dk$.

Then simplify the previous coefficients: $\frac{(g)}{2}\frac{(4\pi)}{(2\pi)^3} = \frac{(g)}{(2\pi)^2}$, so $(\rho_{\text{vac}}) = \frac{g\hbar c}{(2\pi)^2}\int_0^{k_{\max}} k^3dk$. So, the integration result is: $\int_0^{k_{\max}} k^3dk = \frac{k_{\max}^4}{4}$, so $(\rho_{\text{vac}}) = \frac{(g)(\hbar)(c)}{(4\pi)^2}k_{\max}^4$. This is the fourfold divergence relationship: $(\rho_{\text{vac}}) \propto k_{\max}^4$, where $k_{\max}$ is the theoretically allowed maximum wavenumber, which is the short-range or high-energy cutoff scale.

And, if we assume that quantum field theory applies all the way up to the Planck length, then the order of magnitude of the maximum wavenumber is $k_{\max} \sim \frac{1}{\ell_{\text{P}}}$, and the Planck length is $\ell_{\text{P}} = \sqrt{\frac{(\hbar)(G_N)}{(c)^3}}$, then substituting the Planck length: $k_{\max} \sim \sqrt{\frac{(c)^3}{(\hbar)(G_N)}}$, therefore: $k_{\max}^4 \sim \frac{(c)^6}{(\hbar)^2(G_N)^2}$.

Then when we substitute it into the vacuum energy density, we have: $(\rho_{\text{vac}}) \sim \frac{(g)(\hbar)(c)}{(4\pi)^2}\frac{(c)^6}{(\hbar)^2(G_N)^2}$, approximately subtracting $\hbar$: $(\rho_{\text{vac}}) \sim \frac{(g)}{(4\pi)^2}\frac{(c)^7}{(\hbar)(G_N)^2}$, where: $\frac{(c)^7}{(\hbar)(G_N)^2}$, and this is the order of magnitude of Planck energy density.

Substituting the constants: $(c) \approx 3.00 \times 10^8\ \text{m s}^{-1}$, $(\hbar) \approx 1.055 \times 10^{-34}\ \text{J s}$, $(G_N) \approx 6.674 \times$

10^{-11} $\mathrm{m^3\,kg^{-1}\,s^{-2}}$, we can obtain: $\frac{(c)^7}{(\hbar)(G_N)^2} \approx 4.6 \times 10^{113}$ $\mathrm{J\,m^{-3}}$, if we temporarily consider only one degree of freedom and preserve the numerical factors in the integral, then: $(\rho_{\mathrm{vac}}) \approx \frac{4.6 \times 10^{113}}{(4\pi)^2}$ $\mathrm{J\,m^{-3}}$, therefore: $(\rho_{\mathrm{vac}}) \approx 3 \times 10^{111}$ $\mathrm{J\,m^{-3}}$.

Considering the degrees of freedom, cutoff methods, specific definitions, and coefficients in order of magnitude estimation for different fields, the theoretical results are usually roughly written as: $(\rho_{\mathrm{vac,theory}}) \sim 10^{111}$–$10^{113}$ $\mathrm{J\,m^{-3}}$.

We know that the observed values are: $(\rho_{\Lambda,\mathrm{energy}}) \sim 10^{-9}$ $\mathrm{J\,m^{-3}}$, and the theoretical estimate of the Planck scale is approximately: $(\rho_{\mathrm{vac,theory}}) \sim 10^{111}$–$10^{113}$ $\mathrm{J\,m^{-3}}$, and the ratio of the two is: $\frac{(\rho_{\mathrm{vac,theory}})}{(\rho_{\Lambda,\mathrm{energy}})} \sim \frac{10^{111}\text{–}10^{113}}{10^{-9}}$, therefore: $\frac{(\rho_{\mathrm{vac,theory}})}{(\rho_{\Lambda,\mathrm{energy}})} \sim 10^{120}$–$10^{122}$, so usually we say that theoretical estimates are about one hundred and twenty orders of magnitude higher than observed values.

It is interesting that the zero point energy integral of this derivation is divergent: $(\rho_{\mathrm{vac}}) = \frac{(g)(\hbar)(c)}{(4\pi)^2} k_{\mathrm{max}}^4$. When the cutoff wavenumber approaches infinity: $k_{\mathrm{max}} \to \infty$, then: $(\rho_{\mathrm{vac}}) \to \infty$, so infinity must be eliminated, or regularization and renormalization can be used?!

It is interesting that renormalization can absorb infinite parts into the naked cosmological constant, but this does not explain why the finite results after renormalization are so small. Without a complete theory of quantum gravity, we cannot be certain that this ordinary quantum field theory can be consistently applied up to the Planck scale.

And, if the masses and degrees of freedom of bosons and fermions are perfectly matched, the contributions can be cancelled out. However, the sign of the vacuum energy contributions of the boson field and Fermi field is opposite, with the boson field contributing positively and the Fermi field contributing negatively. Formally, it can be written as: $(\rho_{\mathrm{vac}}) \sim \sum_{\mathrm{bosons}} \rho_i - \sum_{\mathrm{fermions}} \rho_j$. However, in reality, if supersymmetry exists, it must have already been broken, so the cancellation is not complete.

Therefore, the so-called "difference of one hundred and twenty orders of magnitude" specifically refers to the estimation of the natural cutoff scale of quantum field theory $\sim 10^{111}$–10^{113} $\mathrm{J\,m^{-3}}$and cosmological observations $\sim 10^{-9}$ $\mathrm{J\,m^{-3}}$, rather than the absolute ratio between two rigorously proven theoretical results.

3 A New Approximate Equation for Measuring the Cosmological Constant

Then let's talk about something interesting, which is the main body of this article. I found an approximate equation for measuring the cosmological constant, and the results it brought me were also very interesting. From the above values, $(\rho_{\Lambda,\text{mass}}) = \frac{(\rho_{\Lambda,\text{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}\ \text{kg}\,\text{m}^{-3} \sim 3 \times 1.67 \times 10^{-27}$–$4 \times 1.67 \times 10^{-27}$, That is to say, from a numerical perspective alone, the value of dark energy mass density is approximately a value between the proton mass multiplied by 3-4, and if it is closer, it is about 3.5. Considering the deviation of the Hubble constant and other errors, this approximate range is quite reasonable from a numerical perspective. However, regarding the meaning, we will not consider it for the time being. Let's first sort out the order of the numerical values. Since it is between 3-4, let's take π. That is to say, if we only look at the numerical value, we have $(\rho_{\Lambda,\text{mass}}) \approx (m_p)(\pi)$.

Has no one thought about such an obvious thing before? I think there must be one, but it's difficult to make up for it later. Let's take a π and then what?! And then there's no 'then'. In the absence of information, even if I guess this approximation, how can I push it down? If others can't do it, then how can I. We're going to talk about recent things. I've been thinking about $(m_n) = (m_p) + (m_e) + (\Delta_m)$, but later realized that this equation is impossible. Instead, I thought that proton mass may be a specific stable structure.

4 A New Prediction of Compton's Wavelength Formula

Why do you say that? In the traditional sense, $(m_n) = (m_p) + (m_e) + (\Delta_m)$ is like building blocks or mathematical series expansion, but this method either doesn't match or has some margin. Later, an interesting idea came to my mind, which was to ask if structures have weight, pure structures have weight, mathematical structures have weight, and pure mathematical structures have weight.

And after delving into the root of this idea, I found that it stems from the questioning of certain concepts in daily life after being divided into two, three, or even more parts: are these divided concepts linearly related, are these divided concepts nonlinearly related, or finally, can any two of these divided concepts be linearly approximated to some extent.

It's interesting that for these things, you don't need to prove as long as you agree, and my idea is that

any two concepts in the separated concepts can be linearly approximated to some extent, so the ultimate direction of this result is very interesting.

For example, let's take electromagnetic field and gravitational field as examples. As we all know, they are very similar in symbolic logic. So, what special effects or conditions may occur when these two concepts are linearly approximated to some extent.

Then we found that from the perspective of charge, pure gravitational potential seems to have no minimum mass, but pure electromagnetic potential has a fundamental charge, and the fundamental charge, proton, electron, and hydrogen atom ionization energy seem to be concentrated on the first element. Then an interesting idea emerged: can any two of the first concepts in any different types of the first element be linearly approximated to some extent.

And these scattered ideas had to be unintentionally written into a form by me before they finally converged.

And the cycloid formula is $\begin{cases} x_B = r(\theta - \sin\theta) \\ \\ y_B = r(1 - \cos\theta) \end{cases}$.

And the question I was curious about before was, if there is $r = \lambda_C = \dfrac{(h)(c)}{(m_e)(c)^2}$, then what would $x_B$be and how would it be verified.

This question came to an end without a solution, and I forgot about it for a long time. However, a few days ago, I finally found the answer, or in other words, I finally found a way to verify it. I intended to obtain several formulas (under international standards, I believe these two formulas are equal on both sides of the equation when only numerical values are calculated), but I cannot verify them at the moment. However, interestingly, we can make do with them for now.

That is $\begin{cases} (G_e) = \dfrac{(e_0)}{(4\pi)(\varepsilon_0)} = \dfrac{(a_0)(c)}{(R_\infty)} \\ \\ (G_N) = \dfrac{(h)}{(m_e)(R_\infty)} \end{cases}$.

So, regarding the Compton scattering formula, we can temporarily have another way of writing it.

That is $\dfrac{(h)(c)}{(m_e)(c)^2} = \dfrac{(h)}{(m_e)(R_\infty)} \times \dfrac{(R_\infty)}{(c)} = \dfrac{(G_N)}{(G_e)} \times (a_0) = (2\pi)[\alpha_0] \times (a_0) = (2\pi)(4\pi)(R_\infty)(a_0)^2$.

That is $\lambda_C = \dfrac{(h)(c)}{(m_e)(c)^2} = \dfrac{(G_N)}{(G_e)} \times (a_0) = (2\pi)[\alpha_0] \times (a_0)$.

That is to say, when $(\theta - \sin\theta) = \dfrac{1}{(2\pi)[\alpha_0]}$ or $(1 - \cos\theta) = \dfrac{1}{(2\pi)[\alpha_0]}$, we can obtain $x_B = (a_0)$ or

$y_B = (a_0)$.

But $\frac{1}{(2\pi)[\alpha_0]} \approx \frac{137.0359992}{2 \times 3.1415926} \approx 21.80995rad$,So we get $(\theta - \sin\theta) = (21.9004872 - \sin(21.9004872)) \approx (21.9004872 - 0.0905372) \approx 21.80995rad$.

And $21.80995rad \approx 21.80995 \times \frac{360^\circ}{2 \times 3.1415926} \approx 1249.6181^\circ = 1249.6181^\circ - 3 \times 360^\circ = 169.6181^\circ$.

And, $21.9004872rad \approx 21.9004872 \times \frac{360^\circ}{2 \times 3.1415926} \approx 1254.8055^\circ = 1254.8055^\circ - 3 \times 360^\circ = 174.8055^\circ$.

And the other $(1 - \cos\theta) = 21.80995rad$ has no solution in the real number field, so we will not consider it for now.

That is to say, for the original Compton scattering formula, we cannot see any correlation effect that occurs when there is a special angle. And, if I am right, then for the data accompanying the Compton scattering experiment, we will observe some physical correlation effect that we previously overlooked around a scattering angle of 175°. And interestingly, if x_B could be a real but unrecognized physical quantity, then what should it be.

Let's ask about artificial intelligence. Its explanation is that the physical entity of x_B is "accumulated wavelength shift in scattering angle space" or "angular integral of lateral momentum transfer". It is a process variable, not a state variable. The most reasonable physical explanation for it is that x_B is the "Quantum Geometric Displacement" induced by Zitterbeiwegung at the vertex of photon electron interaction in the Compton scattering process along the incident direction. It represents the intrinsic spatial shift generated by the interference of positive and negative energy states in scattering events, which cannot be reduced to classical kinematics. It is the cumulative path length (or equivalently, the geometric phase induced by scattering) of the intrinsic motion of electron flutter (Zitterbeiwegung) in the Compton scattering process. It forms a pair of conjugate observations with y_B : x_B is the scattering in the "phase path" space, and y_B is the scattering in the "energy momentum" space. The current experiment only sees the latter, while the former is hidden in the blind spots of standard QED averaging and observability selection. If we reanalyze the data now, we will eventually observe a regular mathematical function graph around the scattering angle of 175 ^{circle}. And when we look back at the previous equation, it becomes very interesting later on. I realized that if we treat pure gravitational potential and pure electromagnetic potential as symbols, what would happen.

5 A new approximate equation for β decay time

For example, $\frac{(h)}{(c)} = \frac{(m_e)(h)}{(m_e)(R_\infty)} \times \frac{(R_\infty)}{(c)} = \frac{(m_e)(G_N)}{(G_e)} \times (a_0)$.

$$\begin{cases} 1.(m_p)(G_N) = (2\pi)^3(a_0)^3(2)\sqrt{(E_{ion})} \\ 2.(m_e)(G_N) = (k_B)(2)(E_{ion}) \\ 3.(E_{ion}) = (\frac{(e_0)}{(4\pi)(\varepsilon_0)})^2 = (G_e)^2 \end{cases}$$

$$\begin{cases} 1.((m_p) + (m_e))(G_N) = (2)(E_{ion})(\frac{(2\pi)^3(a_0)^3}{\sqrt{(E_{ion})}} + (k_B)) \\ 2.(m_n) = (\frac{(m_e)(c)^2}{(2)})^2 \\ 3.(G_N) = (2\pi)[\alpha_0]\sqrt{(E_{ion})} \end{cases}$$

$$\begin{cases} 1.(m_p) = \frac{(2\pi)^3(a_0)^3}{(2\pi)(a_0)(2\pi)(R_\infty)} \\ 2.(m_e) = (2\pi)^3(r_p)(2)(E_{ion}) \\ 3.(m_n) = (\frac{(E_{ion})(a_0)}{(r_e)})^2 \end{cases}$$

Then here, everything comes together, and we go back to the original question, does the structure have weight? The answer is that there is weight. For example, if a broken mirror is made into a circle and all the fragments of a broken mirror are pieced back to their original shape, is it equal to an unbroken mirror? Then we extend the question, do the cracks in this mirror have weight? The answer is that there is weight.

According to this theory, the mass of a neutron is not equal to the mass of a proton plus other masses, because it lacks the mass of a crack, or in other words, it lacks the mass of a structure. And then thinking about what we previously said, 'Any two concepts in the concept after separation can be linearly approximated to some extent.' Therefore, a certain definition of 'crack' can be linearly approximated to some extent by the 'mass of fragments'. However, after the' crack 'is expanded in a certain concept, it is wrong to use the' mass of fragments' linear approximation.

Then, we found that according to this theory, combined with the numerical equation above, proton mass may be a specific stable structure, where scale and mass are like the "mass of fragments" used to the limit, and conceptually the extension of "cracks" is the descriptive means here.

For example, assuming that the mass of neutrons can only be expressed in complex space, the mass representation is similar to $|\Psi^*\Psi|$, that is, the condensed mass of complex space, while the mass of protons is similar to the localized volume of real space, that is, the topological mass of real space, and the electron static mass is similar to the localized volume of real space and the linear integral of interactions, that is, the coupling mass of real space.

So, suppose β decays ($n \to p + e^- + \bar{v}_e$) is the geometric relaxation process of a complex condensed state towards the basis of real space, and the 879s of β decay must be a constant value. According to my method of considering numerical values without dimensional considerations, after my imagination, the decay time of β can definitely be written numerically as: $879 = (\frac{1}{(4\pi)(\varepsilon_0)(c)})^2$, and then considering: $(m_n)-(m_p) = \Delta(m_m)$, after my imagination, there may be: $(m_n)-(m_p) = \Delta(m_m) = \frac{(m_e)}{(4\pi)} \times \frac{1}{(4\pi)(\varepsilon_0)(c)}$, and then we roughly discover: $\frac{\Delta(m_m)}{879} \approx \frac{(m_e)(a_0)(c)}{(2\pi)} = \frac{(m_e)(G_N)}{(2\pi)^3(2)(a_0)}$.

And written in mathematical form, the decay time of β may be: $\int_0^{2\pi} \frac{\Delta(m_m)}{(m_e)(a_0)(c)} d\theta = \iiint_0^{2\pi} \frac{(2)(a_0)\Delta(m_m)}{(m_e)(G_N)} d\theta \approx 879s$.

Interestingly, when viewed in this way, the calculation method for the decay time of β is an identity and is also intertwined with the Bohr radius.

However, when we enter the equation, we find that it is: $\frac{2.52(m_e)}{879} \approx \frac{2.22(m_e)}{879}$ or $\frac{2.52(m_e)}{879} \approx \frac{2.52(m_e)}{1000}$.

And what's even more interesting is that 879s is actually the average lifetime of free neutrons, and the half-life of free neutrons is $879 \times \ln 2 \approx 879 \times 0.693 \approx 609s$. So is this a forced fit? Actually, it's not, because ultimately we still want to predict and verify the real world. So, considering the possibility of it being correct, we can find data to see if there are any abnormalities in the lifetime of free neutrons around 1000s to verify this equation.

So, to repeat the old tune, here we calculate these equations based on the idea of treating these things as a specific stable structure. If we broaden our thinking, perhaps we are standing in the shadow of a higher theory, and we know that what is blocking us is not an incomplete and proven low-energy effective theory. However, we cannot see the specific outline and details that may point to a higher order theory, so we can only temporarily explore and move forward.

6 Analysis of a new approximate equation for the measured value of cosmological constant

From a numerical perspective, $(\rho_{\Lambda,\text{mass}}) = \dfrac{(\rho_{\Lambda,\text{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}\ \text{kg}\,\text{m}^{-3} \sim 3 \times 1.67 \times 10^{-27}$–$4 \times 1.67 \times 10^{-27}$, That is to say, only in numerical terms, $3.5 \approx \pi$, that is, $(\rho_{\Lambda,\text{mass}}) \approx (m_p)(\pi)$.

According to this writing method, we can find that $(m_p)(\pi) = \dfrac{(2\pi)(\pi)(a_0)^2}{(R_\infty)}$, if there is a standard torus T^2 embedded in $\mathbb{R}^3$, and its solid ring volume $V_{T^2} = (2\pi R)(\pi r^2) = \dfrac{(2\pi)(\pi)(a_0)^2}{(R_\infty)}$.

Then we realized that suddenly there was a specific shape, and we knew that mass, volume, and density could be measured only by numerical values in certain situations without considering dimensions. Now, $(m_p)(\pi)(G_N) = \dfrac{(2\pi)^4(a_0)^4(c)}{(R_\infty)}$.

So, is this a coincidence? Before I thought about the cosmological constant, even though I knew how $(m_p)(\pi)$ and (m_p) were calculated numerically, without encountering specific shapes and requirements, they were meaningless.

So, now, if the observed effective cosmological constant is approximately $(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}\ \text{m}^{-2}$, $(\rho_{\Lambda,\text{mass}}) = \dfrac{(\rho_{\Lambda,\text{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}\ \text{kg}\,\text{m}^{-3}$, that is: $(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(G_N)}{(c)^2}(\rho_{\Lambda,\text{mass}}) = \dfrac{(8\pi)(G_N)}{(c)^4}(\rho_{\Lambda,\text{energy}})$.

Interestingly, looking at it this way, the cosmological constant seems to be a constant.

Although it may seem like a piece of nonsense, if we were to fill in the dimensions again, let's consider the simplest way, which is to separate the numerical values represented by physical symbols from the dimensional values represented by physical symbols. In terms of numerical values, we have: $(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(2\pi)^4(a_0)^4}{(R_\infty)(c)}$, and then we assume: $(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(2\pi)^4(a_0)^4}{(R_\infty)(c)} \Rightarrow L^{-2} = \dfrac{L^{-4}}{L^{-1}L^{-1}}$, then, at this point, the values of the physical symbols represented by (a_0), (R_∞), and (c) remain unchanged, but the dimensions are all assumed to be reciprocal of length. Therefore, this equation is now an equivalent formula under the International System of Units.

But now we only provide the simplest form. To achieve dimensional matching, we just need to add a dimensional formula with a numerical approximation of 1 on this basis. Alternatively, to simplify it further, we believe that the numerical value of the physical symbol represented by this simplest form remains unchanged, and the new dimensional relationship represented by the physical symbol is already correct. Therefore, the specific dimension represented by each physical symbol now depends on its own

means.

7 The significance of cosmological constant

Then, following this format, we can use artificial intelligence to guess its meaning. That is, the cosmological constant is not determined by a single energy scale, but by the significant vacuum fluctuations generated by a high energy scale, and the effective curvature remaining after being jointly adjusted (or diluted) by two characteristic energy scales. If the sign dimension corresponding to its numerical value remains unchanged, this form means the distribution of a four-dimensional torus at a specific scale on the Rydberg frequency, or in other words, the phase space laterality exhibited by a four-dimensional torus manifold of a specific size in a physical process with the Rydberg frequency as the natural clock. And this passage not only applies to the cosmological constant, but also to the equation of proton mass manifested in this process. And the most likely connection between them, in the most beautiful words of mathematics, it is $\int_M d\omega = \int_{\partial M} \omega$. However, looking at it this way, the cosmological constant still seems to be a constant.

8 References

Some of the deductions and theories in this article are already based on professional knowledge, while the other assumptions and connections are entirely based on my personal research, so there are no references in this article.

一个宇宙学常数的测量值的新的近似等式

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摘要：我找到一个宇宙学常数的测量值的新的近似等式，它可能会带来一个离谱却有趣的结果，即，宇宙学常数好像是个常数。而这个发现要从康普顿散射公式的新发现开始，并且在这个过程中我们给出一个这个新发现能否证伪的证据，再然后对于另一个现象 β 衰变时间，我们给出一个新的近似等式，然后回到宇宙学常数，最后发现质子质量是其中的隐线。

关键词：宇宙学常数, 康普顿散射公式, β 衰变时间, 质子质量

9 宇宙学常数的测量值

我们知道宇宙学常数的测量值大约是 $(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}\ \text{m}^{-2}$。

也就是：$(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(G_N)}{(c)^2}(\rho_{\Lambda,\text{mass}}) = \dfrac{(8\pi)(G_N)}{(c)^4}(\rho_{\Lambda,\text{energy}})$。

而：$(\rho_{\text{crit,mass}}) = \dfrac{3(H_0)^2}{(8\pi)(G_N)}$，以及：$(\rho_{\Lambda,\text{mass}}) = (\Omega_\Lambda)(\rho_{\text{crit,mass}})$，代入宇宙学常数关系后，得到：$(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(G_N)}{(c)^2}(\Omega_\Lambda)\dfrac{3(H_0)^2}{(8\pi)(G_N)}$，因此：$(\Lambda_{\text{eff}}) = \dfrac{3(\Omega_\Lambda)(H_0)^2}{(c)^2}$。然后使用 $(H_0) \approx 2.18 \times 10^{-18}\ \text{s}^{-1}$ 和 $(\Omega_\Lambda) \approx 0.685$ 后我们可以得到：$(\Lambda_{\text{eff}}) \approx \dfrac{3(0.685)(2.18 \times 10^{-18})^2}{(2.998 \times 10^8)^2}\ \text{m}^{-2}$。即：$(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}\ \text{m}^{-2}$。

其中，Planck 2018 所对应的哈勃常数约为：$(H_0) = 67.36 \pm 0.54\ \text{km}\,\text{s}^{-1}\,\text{Mpc}^{-1}$，使用换算关系：$1\ \text{Mpc} = 3.08567758 \times 10^{19}\ \text{km}$，因此：$(H_0) = \dfrac{67.36\ \text{km}\,\text{s}^{-1}}{3.08567758 \times 10^{19}\ \text{km}} \approx 2.183 \times 10^{-18}\ \text{s}^{-1}$。

哈勃常数 (H_0) 可以通过观测相对直接地测定：测量邻近星系的距离，以及它们因宇宙膨胀产生的红移速度关系。常见方法包括造父变星—Ia 型超新星距离阶梯、引力波标准汽笛、强引力透镜时延等。但是 (H_0) 的不同测量方法目前尚未完全一致。例如，基于本地距离阶梯的结果通常约为 $73\ \text{km}\,\text{s}^{-1}\,\text{Mpc}^{-1}$；而

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把宇宙微波背景辐射数据放入标准 CDM 模型后推得的结果约为 $67.4\ \mathrm{km\,s^{-1}\,Mpc^{-1}}$。这种差异称为“哈勃张力”。

但是，宇宙学常数密度参数 $_\Lambda$ 不能像实验室里直接读取一个仪器数值那样被单独直接测量。它是通过宇宙微波背景辐射、Ia 型超新星、重子声学振荡、星系分布和引力透镜等观测数据，结合宇宙学模型后拟合或推断出来的参数。

10 宇宙学常数的普朗克尺度的理论值

而在广义相对论中，真正影响宇宙膨胀的是有效宇宙学常数：$(\Lambda_{\mathrm{eff}}) = (\Lambda_{\mathrm{bare}}) + \dfrac{(8\pi)(G_N)}{(c)^4}(\rho_{\mathrm{vac}})$。

这里：$(\Lambda_{\mathrm{bare}})$ 表示理论中的裸宇宙学常数。而：(ρ_{vac}) 表示量子场真空涨落贡献。

观测到的有效宇宙学常数约为：$(\Lambda_{\mathrm{eff}}) \approx 1.1\times10^{-52}\ \mathrm{m^{-2}}$，$(\rho_{\Lambda,\mathrm{mass}}) = \dfrac{(\rho_{\Lambda,\mathrm{energy}})}{(c)^2} \approx 5.8\times10^{-27}\ \mathrm{kg\,m^{-3}}$。

其中有效宇宙学常数约为：$(\Lambda_{\mathrm{eff}}) \sim \dfrac{(8\pi)(G_N)}{(c)^4} \times 10^{-9}\ \mathrm{J\,m^{-3}}$。

而理论估计为什么比观测值大约高一百二十个数量级就是指：$(\Lambda_{\mathrm{vac}}) \sim \dfrac{(8\pi)(G_N)}{(c)^4} \times 10^{113}\ \mathrm{J\,m^{-3}}$，其中真空能量密度 $(\rho_{\mathrm{vac}}) \sim \dfrac{(g)}{(4\pi)^2}\dfrac{(c)^7}{(\hbar)(G_N)^2}$ 取普朗克尺度估计 $(\rho_{\mathrm{vac,theory}}) \sim 10^{111}$–$10^{113}\ \mathrm{J\,m^{-3}}$。

虽然很离谱，但是我们还是要说说这个值是怎么来的，在量子场论中，每一个动量模式都可以看作一个量子简谐振子。量子简谐振子的能级为：$E_n = \left(n+\frac{1}{2}\right)(\hbar)\omega$，即使处于基态，也就是取：$n=0$，它仍具有零点能：$E_0 = \frac{1}{2}(\hbar)\omega$。其中：$(\hbar) = \dfrac{(h)}{(2\pi)}$，对于无质量粒子，例如光子，频率和波数之间满足：$\omega = (c)k$。

因此，一个模式的零点能为：$E_0 = \frac{1}{2}(\hbar)(c)k$。

而在体积为 V 的空间中，动量模式的状态数密度为：$\dfrac{V}{(2\pi)^3}d^3k$，它除以体积后，单位体积内的模式数为：$\dfrac{d^3k}{(2\pi)^3}$。因此，零点能量密度可以写为：$(\rho_{\mathrm{vac}}) = \frac{1}{2}\int \dfrac{d^3k}{(2\pi)^3}(\hbar)\omega$。

那么，如果考虑有 g 个内部自由度，例如偏振或不同粒子种类，则：$(\rho_{\mathrm{vac}}) = \dfrac{(g)}{2}\int \dfrac{d^3k}{(2\pi)^3}(\hbar)(c)k$。

那么，如果我们利用球坐标关系：$d^3k = (4\pi)k^2dk$，就可以得到：$(\rho_{\mathrm{vac}}) = \dfrac{(g)}{2}\dfrac{4\pi}{(2\pi)^3}\int_0^{k_{\max}}(\hbar)(c)k^3dk$。

然后再化简前面的系数：$\dfrac{(g)}{2}\dfrac{(4\pi)}{(2\pi)^3} = \dfrac{(g)}{(2\pi)^2}$，所以，$(\rho_{\mathrm{vac}}) = \dfrac{g\hbar c}{(2\pi)^2}\int_0^{k_{\max}} k^3dk$。那么，积分结果就有：$\int_0^{k_{\max}} k^3dk = \dfrac{k_{\max}^4}{4}$，所以，$(\rho_{\mathrm{vac}}) = \dfrac{(g)(\hbar)(c)}{(4\pi)^2}k_{\max}^4$。这就是四次发散关系：$(\rho_{\mathrm{vac}}) \propto k_{\max}^4$，这里的 $k_{\max}$ 是理论允许的最大波数，也就是短距离或高能量截止尺度。

以及，如果假定量子场论一直适用到普朗克长度，那么最大波数的数量级为：$k_{\max} \sim \dfrac{1}{\ell_{\mathrm{P}}}$，且普朗克长度为：$\ell_{\mathrm{P}} = \sqrt{\dfrac{(\hbar)(G_N)}{(c)^3}}$，那么，代入普朗克长度：$k_{\max} \sim \sqrt{\dfrac{(c)^3}{(\hbar)(G_N)}}$，因此：$k_{\max}^4 \sim \dfrac{(c)^6}{(\hbar)^2(G_N)^2}$。

然后我们将其代入真空能量密度的话就有：$(\rho_{\mathrm{vac}}) \sim \dfrac{(g)(\hbar)(c)}{(4\pi)^2}\dfrac{(c)^6}{(\hbar)^2(G_N)^2}$，约去一个 $\hbar$ 后：$(\rho_{\mathrm{vac}}) \sim$

$\frac{(g)}{(4\pi)^2}\frac{(c)^7}{(\hbar)(G_N)^2}$，其中：$\frac{(c)^7}{(\hbar)(G_N)^2}$，而这，就是普朗克能量密度的数量级。

再代入常数：$(c) \approx 3.00 \times 10^8\ \mathrm{m\,s^{-1}}$，$(\hbar) \approx 1.055 \times 10^{-34}\ \mathrm{J\,s}$，$(G_N) \approx 6.674 \times 10^{-11}\ \mathrm{m^3\,kg^{-1}\,s^{-2}}$，可得：$\frac{(c)^7}{(\hbar)(G_N)^2} \approx 4.6 \times 10^{113}\ \mathrm{J\,m^{-3}}$，如果再暂时只考虑一个自由度，并保留积分中的数值因子，则：$(\rho_{\mathrm{vac}}) \approx \frac{4.6 \times 10^{113}}{(4\pi)^2}\ \mathrm{J\,m^{-3}}$，因此：$(\rho_{\mathrm{vac}}) \approx 3 \times 10^{111}\ \mathrm{J\,m^{-3}}$。

而考虑到不同场的自由度、截止方式、具体定义以及数量级估计中的系数，通常将理论结果粗略写成：$(\rho_{\mathrm{vac,theory}}) \sim 10^{111}$–$10^{113}\ \mathrm{J\,m^{-3}}$。

我们知道观测值为：$(\rho_{\Lambda,\mathrm{energy}}) \sim 10^{-9}\ \mathrm{J\,m^{-3}}$，普朗克尺度的理论估计约为：$(\rho_{\mathrm{vac,theory}}) \sim 10^{111}$–$10^{113}\ \mathrm{J\,m^{-3}}$，而二者的比值为：$\frac{(\rho_{\mathrm{vac,theory}})}{(\rho_{\Lambda,\mathrm{energy}})} \sim \frac{10^{111}\text{–}10^{113}}{10^{-9}}$，因此：$\frac{(\rho_{\mathrm{vac,theory}})}{(\rho_{\Lambda,\mathrm{energy}})} \sim 10^{120}$–$10^{122}$，所以说，通常我们说理论估计比观测值大约一百二十个数量级。

有趣的是，这个推导的零点能积分是发散的：$(\rho_{\mathrm{vac}}) = \frac{(g)(\hbar)(c)}{(4\pi)^2}k_{\mathrm{max}}^4$，当截止波数趋于无穷时：$k_{\mathrm{max}} \to \infty$，于是：$(\rho_{\mathrm{vac}}) \to \infty$，所以必须消灭掉无穷，那么或者使用使用正则化和重整化处理?!

有趣的是，重整化可以把无穷大的部分吸收到裸宇宙学常数中，但这并没有解释为什么重整化后的有限结果如此之小。而在没有完整量子引力理论的情况下，我们不能确信这个普通量子场论可以一直适用到普朗克尺度。

以及，如果玻色子和费米子的质量及自由度完全匹配，贡献可以抵消，而，玻色场和费米场的真空能贡献符号相反，玻色场贡献为正，费米场贡献为负，形式上可以写成：$(\rho_{\mathrm{vac}}) \sim \sum_{\mathrm{bosons}} \rho_i - \sum_{\mathrm{fermions}} \rho_j$，但是，现实中超对称性如果存在，必然已经发生破缺，因此抵消并不完全。

因此，所谓“差一百二十个数量级”，具体指的是：量子场论自然截止尺度估计 $\sim 10^{111}$–$10^{113}\ \mathrm{J\,m^{-3}}$ 与宇宙学观测值 $\sim 10^{-9}\ \mathrm{J\,m^{-3}}$ 之间的巨大差异，而不是两个已经被严格证明的理论结果之间的绝对比值。

11 宇宙学常数的测量值的新的近似等式

然后我们再说些有趣的，也就是本篇文章的正文，我找到一个宇宙学常数的测量值的近似等式，它带给我的结果也很有趣。从上面的数值来看，$(\rho_{\Lambda,\mathrm{mass}}) = \frac{(\rho_{\Lambda,\mathrm{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}\ \mathrm{kg\,m^{-3}} \sim 3 \times 1.67 \times 10^{-27}$–$4 \times 1.67 \times 10^{-27}$，也就是说，仅从数值上来看，暗能量质量密度的数值近似于质子质量乘以 3-4 之间的某个数值，更接近的话，大约是 3.5，而考虑到哈勃常数的偏差以及其它误差，那么，从数值上来看，这个近似范围甚为合理。但是，意义呢，我们暂时不考虑意义，先把数值的顺序捋完了再说。既然是 3-4 之间，那么就不妨取个 π 吧，也就是，仅看数值的话，我们有 $(\rho_{\Lambda,\mathrm{mass}}) \approx (m_p)(\pi)$。

这么明显的东西，之前就没人想过吗，我觉得肯定有，但是补上后续是很难的，取个 π 吧，然后呢?! 然后就没有然后呢，在信息缺失的情况下，就算猜测到这个近似，后面还怎么往下推动呢，如果别人不行的话，那么我怎么可以的呢。这就要聊到最近的事情了，我最近在想 $(m_n) = (m_p) + (m_e) + (\Delta_m)$，后来发现这个等式不可能，反而觉得质子质量可能是一个特定的稳定的结构。

12 康普顿波长公式的新的预言

为什么这么说呢，传统意义上，$(m_n) = (m_p) + (m_e) + (\Delta_m)$ 这种方式就像堆积木，又或者，像是数学上的级数展开，但是这种方法要么是对不上，要么是有余量，后来有个有意思的想法出现在我的脑中，即，想到一个有趣的追问，结构有没有重量，纯结构有没有重量，数学结构有没有重量，纯数学结构有没有重量。

而追根究底后我发现这个想法的根源是源于日常生活里的对某些概念的二分三分甚至多分后的追问：这些分完后的概念是线性相关吗，这些分完后的概念是非线性相关吗，或者最后拆问一下，这些分完后的概念中的任意两个概念可以在某种程度上线性近似吗。

有趣的是，对于这些东西你不需要证明只要认同就行了，而我的想法就是分完后的概念中的任意两个概念可以在某种程度上线性近似，那么这个结果的最终导向就很有趣了。

比如，我们拿电磁场和引力场来举个例子，众所周知，它俩在符号逻辑中非常相似，那么这两个概念在某种程度上线性近似时会有什么特殊效果或特殊条件出现吗。

然后我们发现从电荷来看，纯引力势好像没有最小质量，但是纯电磁势我们有基本电荷，而基本电荷、质子、电子、氢原子电离能好像都集中在第一个元素上面，然后一个有趣的想法就出现来，第一个元素中任意不同种类中的任意两个第一个概念可以在某种程度上线性近似吗。

而这些零散的想法都要在我把康普顿波长公式无意中写成一种形式才最终汇聚起来。

我们知道，康普顿散射公式为，$\Delta\lambda = \lambda_C(1 - \cos\theta) = \dfrac{(h)(c)}{(m_e)(c)^2}(1 - \cos\theta)$。

而摆线公式为，$\begin{cases} x_B = r(\theta - \sin\theta) \\ y_B = r(1 - \cos\theta) \end{cases}$。

而之前我好奇的问题是，如果有，$r = \lambda_C = \dfrac{(h)(c)}{(m_e)(c)^2}$，那么 x_B 会是什么，以及怎么验证呢。

这个问题无疾而终，很长时间内我都忘了，但是，前些天，我终于找到答案了，或者说，我终于找到可以验证的方法了。我有意得到几个公式（在国际标准下，这两个公式我认为仅计算数值的情况下等式两

边相等），但是暂时无法验证，不过，有趣的是，我们可以先将就着用。

即，$\begin{cases}(G_e)=\dfrac{(e_0)}{(4\pi)(\varepsilon_0)}=\dfrac{(a_0)(c)}{(R_\infty)}\\(G_N)=\dfrac{(h)}{(m_e)(R_\infty)}\end{cases}$。

那么，关于康普顿散射公式，我们就可以暂时有另一个写法。

即，$\dfrac{(h)(c)}{(m_e)(c)^2}=\dfrac{(h)}{(m_e)(R_\infty)}\times\dfrac{(R_\infty)}{(c)}=\dfrac{(G_N)}{(G_e)}\times(a_0)=(2\pi)[\alpha_0]\times(a_0)=(2\pi)(4\pi)(R_\infty)(a_0)^2$。

即，$\lambda_C=\dfrac{(h)(c)}{(m_e)(c)^2}=\dfrac{(G_N)}{(G_e)}\times(a_0)=(2\pi)[\alpha_0]\times(a_0)$。

也就是说，当 $(\theta-\sin\theta)=\dfrac{1}{(2\pi)[\alpha_0]}$ 或 $(1-\cos\theta)=\dfrac{1}{(2\pi)[\alpha_0]}$，我们可以得到 $x_B=(a_0)$ 或 $y_B=(a_0)$。

而，$\dfrac{1}{(2\pi)[\alpha_0]}\approx\dfrac{137.0359992}{2\times3.1415926}\approx21.80995rad$，所以我们得到，$(\theta-\sin\theta)=(21.9004872-\sin(21.9004872))\approx(21.9004872-0.0905372)\approx21.80995rad$。

而 $21.80995rad\approx21.80995\times\dfrac{360^\circ}{2\times3.1415926}\approx1249.6181^\circ=1249.6181^\circ-3\times360^\circ=169.6181^\circ$。

以及，$21.9004872rad\approx21.9004872\times\dfrac{360^\circ}{2\times3.1415926}\approx1254.8055^\circ=1254.8055^\circ-3\times360^\circ=174.8055^\circ$。

而另一个 $(1-\cos\theta)=21.80995rad$ 在实数域内无解，我们暂不考虑。

也就是说，对于原来的康普顿散射公式，我们是看不出有什么存在特殊角度时会发生什么关联效应的。

而，如果我是对的，那么，对于康普顿散射实验时附带的数据而言，那么我们将在散射角等于 175° 附近观察到我们之前忽略掉的某种物理关联效应。而有趣的是如果 x_B 可能是一个真实的、但尚未被识别的物理量，那么它应该是什么。

问下人工智能吧，它给解释大概是，x_B 的物理实体是“散射角空间中的累积波长偏移”或“横向动量转移的角积分”。它是一个过程量（process variable），而非状态量。它最合理的物理解释是 x_B 是康普顿散射过程中，光子-电子相互作用顶点处由颤动（Zitterbewegung）诱导的、沿入射方向的”量子几何位移”（Quantum Geometric Displacement）。

它代表了散射事件中因正负能态干涉而产生的、不可归约为经典运动学的内禀空间偏移，是在康普顿散射过程中，电子颤动（Zitterbewegung）内禀运动的累积路径长度（或等价地，散射诱导的几何相位）。它和 y_B 构成一对共轭观测量：x_B 是“相位-路径”空间的散射，y_B 是“能量-动量”空间的散射。现行实验只看到了后者，而前者隐藏在标准 QED 的平均化处理和可观测量选择的盲区之中。

而现在我们重新分析数据的话，那么最终会在散射角等于 175° 附近观察一个有规律的数学函数图像。而我们再回顾之前的等式，然后到了后面，这就很有趣了，我意识到如果我们把纯引力势和纯电磁势当成一个符号来看待呢。

13 β 衰变时间的新的近似等式

比如，$\frac{(h)}{(c)}=\frac{(m_e)(h)}{(m_e)(R_\infty)}\times\frac{(R_\infty)}{(c)}=\frac{(m_e)(G_N)}{(G_e)}\times(a_0)$。

$$\begin{cases}1.(m_p)(G_N)=(2\pi)^3(a_0)^3(2)\sqrt{(E_{ion})}\\2.(m_e)(G_N)=(k_B)(2)(E_{ion})\\3.(E_{ion})=(\frac{(e_0)}{(4\pi)(\varepsilon_0)})^2=(G_e)^2\end{cases}$$

$$\begin{cases}1.((m_p)+(m_e))(G_N)=(2)(E_{ion})(\frac{(2\pi)^3(a_0)^3}{\sqrt{(E_{ion})}}+(k_B))\\2.(m_n)=(\frac{(m_e)(c)^2}{(2)})^2\\3.(G_N)=(2\pi)[\alpha_0]\sqrt{(E_{ion})}\end{cases}$$

$$\begin{cases}1.(m_p)=\frac{(2\pi)^3(a_0)^3}{(2\pi)(a_0)(2\pi)(R_\infty)}\\2.(m_e)=(2\pi)^3(r_p)(2)(E_{ion})\\3.(m_n)=(\frac{(E_{ion})(a_0)}{(r_e)})^2\end{cases}$$

然后在这里，所有东西都汇聚在一起来，然后回到最初的问题，结构有重量吗，这个答案是有重量，举个不恰当的例子，破镜重圆，一个破了的镜子的所有碎片拼回原有的样子等于原来没有碎的镜子吗，然后延伸一个问题，那么，这个镜子的裂缝有重量吗，这个答案是有重量。

那么按照这个理论，中子的质量不等于质子的质量加其它质量，因为它少了“裂缝的质量”，或者说，它少了“结构的质量”。然后再想到我们之前说的“分完后的概念中的任意两个概念可以在某种程度上线性近似”，那么，“裂缝”的某种定义就可以在某种程度上用“碎片的质量”线性近似，但是，“裂缝”在某种概念上扩展以后，再用“碎片的质量”线性近似就是错的了。

然后，我们发现，按照这个理论，再结合上面的数值等式，质子质量可能是一个特定的稳定的结构，在这里，尺度和质量就像是用到极限的“碎片的质量”，概念上“裂缝”的延伸才是这里的描述手段。

比如，假设，中子的质量用复空间才能表示，质量表示类似于 $|\Psi^*\Psi|$，即，复空间的凝聚质量，而质子的质量类似于实空间的局域化体积，即，实空间的拓扑质量，而电子静止质量则类似于实空间的局域化体积和相互作用的线性积分，即，实空间的耦合质量。

那么，假设，β 衰变（$n\to p+e^-+\bar{v}_e$）就是复凝聚态向实空间基底的几何驰豫过程，而 β 衰变的 879s 就一定是某个定值，而按照我考虑数值而不考虑量纲的方法来看，经过我胡思乱想以后，β 衰

变时间从数值上来说就一定可以写成：$879 = (\frac{1}{(4\pi)(\varepsilon_0)(c)})^2$，再考虑到：$(m_n) - (m_p) = \Delta(m_m)$，经过我胡思乱想以后，可能有：$(m_n) - (m_p) = \Delta(m_m) = \frac{(m_e)}{(4\pi)} \times \frac{1}{(4\pi)(\varepsilon_0)(c)}$，然后我们简单粗暴地发现：$\frac{\Delta(m_m)}{879} \approx \frac{(m_e)(a_0)(c)}{(2\pi)} = \frac{(m_e)(G_N)}{(2\pi)^3(2)(a_0)}$。

而写成数学形式，β 衰变时间可能是：$\int_0^{2\pi} \frac{\Delta(m_m)}{(m_e)(a_0)(c)} d\theta = \iint_0^{2\pi} \frac{(2)(a_0)\Delta(m_m)}{(m_e)(G_N)} d\theta \approx 879s$。

而有趣的是，这样看待的话，β 衰变时间的计算方式是个恒等式，并且还是和玻尔半径咬合在一起。

但是，带入等式我们发现是：$\frac{2.52(m_e)}{879} \approx \frac{2.22(m_e)}{879}$，或者，$\frac{2.52(m_e)}{879} \approx \frac{2.52(m_e)}{1000}$。

而更有趣的是，其实 879s 是自由中子的平均寿命，而自由中子的半衰期为 $879 \times \ln 2 \approx 879 \times 0.693 \approx 609s$，那么这算是强行拟合吗，其实不算，因为归根究底我们还是想预言和验证现实世界，那么，考虑它是对的可能性，我们找数据看看自由中子的寿命在 1000s 左右有没有异常就能验证这个等式了。

那么，再老调重弹一句，在这里，我们是按照把这些东西当成是一个特定的稳定的结构的想法来计算才能得到这些等式的。思路放开了想的话，或许，我们站着一个更高的理论的阴影里，我们知道遮住我们的不是一个已经被证实的不完备的低能有效理论，但是我们也看不清这个可能指向更高阶理论的具体轮廓和细节，所以只能暂时摸索着前进。

14 宇宙学常数的测量值的新的近似等式的解析

从数值来看，$(\rho_{\Lambda,\text{mass}}) = \frac{(\rho_{\Lambda,\text{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}\ \text{kg m}^{-3} \sim 3 \times 1.67 \times 10^{-27}$–$4 \times 1.67 \times 10^{-27}$，也就是说，仅从数值上来看，$3.5 \approx \pi$，即，$(\rho_{\Lambda,\text{mass}}) \approx (m_p)(\pi)$。

而按照这个写法，我们可以发现 $(m_p)(\pi) = \frac{(2\pi)(\pi)(a_0)^2}{(R_\infty)}$，如果有嵌入 $\mathbb{R}^3$ 的标准环面 T^2，且它的实心环体的体积 $V_{T^2} = (2\pi R)(\pi r^2) = \frac{(2\pi)(\pi)(a_0)^2}{(R_\infty)}$。

然后我们发现，这怎么突然就有了特定的形状，而我们知道质量、体积、密度在特定情况下我们可以只看数值而不看量纲的。而现在，$(m_p)(\pi)(G_N) = \frac{(2\pi)^4(a_0)^4(c)}{(R_\infty)}$。

那么，这是巧合吗，在没想到宇宙常数之前，$(m_p)(\pi)$ 和 (m_p) 在数值里我就算知道它是怎么算出来的，但是没有碰到特定的形状和特定需求，它们是没有意义的。

那么，现在，如果，观测到的有效宇宙学常数约为：$(\Lambda_{\text{eff}}) \approx 1.1 \times 10^{-52}\ \text{m}^{-2}$，$(\rho_{\Lambda,\text{mass}}) = \frac{(\rho_{\Lambda,\text{energy}})}{(c)^2} \approx 5.8 \times 10^{-27}\ \text{kg m}^{-3}$，也就是：$(\Lambda_{\text{eff}}) = \frac{(8\pi)(G_N)}{(c)^2}(\rho_{\Lambda,\text{mass}}) = \frac{(8\pi)(G_N)}{(c)^4}(\rho_{\Lambda,\text{energy}})$。

那么，我们是否仅从数值假设它成立试试看呢：$(\Lambda_{\text{eff}}) = \frac{(8\pi)(G_N)}{(c)^2}(m_p)(\pi) = \frac{(8\pi)(2\pi)^4(a_0)^3\sqrt{(E_{ion})}}{(c)^2} = \frac{(8\pi)(2\pi)^4(a_0)^4(c)}{(c)^2(R_\infty)} = \frac{(8\pi)(2\pi)^4(a_0)^4}{(R_\infty)(c)} = \frac{(8\pi)(2\pi)^4(a_0)^4(m_e)(r_e)}{(e_0)(a_0)}$。

有趣的是，这样看的话，宇宙常数好像是个常数。

虽然好像说了一句废话，但是，如果我们再补全量纲呢，我们再来考虑一个最简单的办法，即，物理符号代表的数值和物理符号代表的量纲分离，从数值来说，我们有：$(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(2\pi)^4(a_0)^4}{(R_\infty)(c)}$，这时我们再假设：$(\Lambda_{\text{eff}}) = \dfrac{(8\pi)(2\pi)^4(a_0)^4}{(R_\infty)(c)} \Rightarrow L^{-2} = \dfrac{L^{-4}}{L^{-1}L^{-1}}$，那么，此时，$(a_0)$、$(R_\infty)$、$(c)$ 代表的物理符号的数值不变，但是量纲都重新假设并假设为都是长度的倒数，那么，现在这个等式就是国际单位制下的等价公式。

但是现在我们只提供了一个最简形式，想要量纲匹配，只要在这个基础上添加数值近似为 1 的量纲公式就行了。要么，再简单点儿，我们认为这个最简形式代表的物理符号的数值不变，且现在物理符号代表的新量纲关系已经是对的了，那么，现在每个物理符号具体代表什么量纲就看各自的手段了。

15 宇宙学常数的意义

然后，按照这个形式，我们再借助人工智能来猜测一下它的意义。

即，宇宙学常数并非由单一能标决定，而是由一个高能标度产生的巨大真空涨落，经过两个特征能标的共同调节（或稀释）后，残留下来的有效曲率。

而保证它数值对应的符号量纲不变的话，这个形式的意思是，某个特定尺度的四维环面在里德伯频率上的分布，或者说，某个特定尺寸的四维环面流形，在以里德伯频率为自然时钟的物理过程中，所展现出的相空间侧度。且这段话不仅对宇宙学常数适用，对质子质量在这个过程中展现的等式也适用。

而它们之间最可能的联系，用数学最美妙的话说，就是，$\int_M d\omega = \int_{\partial M} \omega$。

但是，这样看的话，宇宙学常数好像还是一个常数。

16 参考文献

本篇文章的部分推导和理论已经是专业常识，另外的部分假设和联系完全是基于本人的个人研究，所以，本篇文章无参考文献。